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## AOC C6-1 and -2: Surface water bodies

Two surface water bodies bound the site: Crane's Creek to the south and Arthur Kill to the east. Both have historically received direct and indirect discharges from plant process areas. Each of them has been discussed in the April 2006 RIWP and previous documents.

AOC C6-1: Crane's Creek / NADUL NAME - P. ANGY Seuse S'A (SO)

Crane's Creek was originally a natural marsh drainage channel that was altered, redirected, and connected to the City of Perth Amboy combined sewer system during the first half of the 20th century<sup>31</sup>. Crane's Creek receives effluent from the Garretson Street combined sewer overflow (GSO). Therefore, during recent inspections of the sewer outfall at the head of the creek, human\_waste, sanitary products, and contraceptive devices were observed stranded just above the open water. NPDES outfall 002 discharged to Crane's Creek.

Soil sampling and drilling has confirmed that Crane's Creek is bounded by slag fill on both sides. During investigations of the South Property, a monitoring well was installed on the north bank of Crane's Creek, downgradient of the former Acid Pond. This monitoring well confirmed that shallow groundwater with concentrations of metals above the State Standard is discharging to Crane's Creek. Therefore, more investigation of surface water and sediment is proposed in Section 5.6.

AOC C6-2: Arthur Kill (Plan on D. tw) = Losowal os les ocise ans

The pier into Arthur Kill was a loading and unloading area. Monitoring wells at the bulkhead on-site have detected groundwater contamination above the NJDEP Standards for heavy metals. A discharge of No. 6 fuel oil has been defined underground in close proximity to the same bulkhead. No dissolved organic constituents were detected in the groundwater from well MW-12s at the edge of the free product accumulation, but a small tar seep has been observed at the shore of Arthur Kill. NJDEP has requested sampling to verify dilution modeling that shows no adverse affect is expected for surface water in Arthur Kill. Therefore, investigation of the water and sediment quality for heavy metals is proposed in Section 5.6.

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Whitsee Remedial Investigation Workplan: ASARCO Incorporated, "South Property", JMZ Geology, July 2001.

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AOC C7: Culvert

The 1928 plant map shows a single box culvert located near the western end of the 50 foot easement on the south side of the property. The culvert carried the drainage ditch from the south side of the plant (NPDES outfall 002) beneath the NL easement. On the south side of the easement the open ditch continues to Crane's Creek across property now owned by Kinder-Morgan, Inc.

Upstream of the culvert, the ditch is still present along the ASARCO south property boundary, outside the fence line, on NL Industries property. As a result of the cessation of process discharges from ASARCO coupled with the reduction of storm sewer discharges as result of on-site demolition the ditch now receives overland flow and any remaining input from the NL site. The existing culvert has a different configuration and a greater length than that shown on historical ASARCO maps. It is now 24-inch diameter reinforced concrete pipe and it starts on the NL site, crosses under the 50 foot easement, and terminates on the South Property. This indicates that it was reconstructed after 1928. The culvert inlet and outfall are not on ASARCO property. Sediment sampling will be conducted upstream of the culvert at the NPDES 002 outfall location. Surface water and sediment sampling will be conducted downstream of the culvert in Cranes Creek (see Sections 5.6 and 5.8). Romes ( See - ( Per 12 Somme

AOC C8-1 and -2: Sumps and drywells

AOC C8-1: Former Arlington Lead drywell

This small structure was located on the west side of the former lead products building. The drywell received steam condensate discharges from the former lead rolling mill at this location. The drywell was excavated and contaminated soil was removed during 1994 as part of the facility cleanup under ISRA Case No. 92526. Post-excavation samples indicated elevated concentrations of lead (2,460 mg/kg) and PHC (16,900 mg/kg) adjacent to the building funndation Hawayer, further soil removal was not possible without jeopardizing the integrity of the structure and no further action was recommended. NJDEP issued a No Further Action (NFA) approval letter for the Arlington Lead facility on May 21, 1997. The NFA applied only to the Arlington Lead leasehold area, which was limited to the beliding interior. The residual soil contamination at the drywell was "to be addressed under the site wide Memorandum of Agreement for 1160 State Street". Documents pertaining to the Arlington Lead cleanup, including the work done at the drywell location were provided as Appendix J of the April 2006 RIW. Therefore, no further investigation is proposed.

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## AOC C8-2: "Snmp" outside former research buitding

This is a structure located on the north side of the former research building. This feature was identified as a sump by NJDEP Bureau of Site Assessment personnel conducting an investigation of the site during 1986. The investigation included a site inspection and a limited sampling program. A copy of the NJDEP memorandum documenting the investigation is provided as Appendix G.

At that time of the NJDEP investigation, the sump contained approximately nine inches of "yellowish clear" water and an unspecified thickness of "oily, sandy sediment". Both the standing water and sediment were sampled. The samples were reportedly analyzed for PP+40, but no results were found. In ah internal memo dated June 15, 1987 (see Appendix G) the Bureau of Site Assessment referred the case to Hazardous Waste Enforcement. No further specific actions were taken regard to the sump.

We have examined the north side of the research building and found a 4 foot by 35 foot access pit to a basement area. The pit was dry at the time of our inspection. No sump was seen during our inspection, but litter and debris were present and the pit was inaccessible. Further investigation is proposed in Section 5.5.

3.4 Part D: Discharge and Disposal Areas

## AOC D1-1 through -5: Open Pipe Discharges

Five open pipe discharges are present. These are historic discharge points which were established as NPDES permitted outfalls in 1974. The location of each is illustrated on Figure 6.

AOC D1-1: Open pipe discharge along the south fence line OSFReco

This discharge is conducted through municipal storm sewers to Cranes Creek (Figure 6). It is NPDES Permit outfall 001, formerly a ditch) then a box drain and finally a pipe. This outfall serviced the southwest portion of the facility where pipes and drains received both surface run-off and cooling water. The storm water inlets to this pipe are still active. Further investigation is proposed in Section 5.8.

AOC D1-2: Open pipe/open ditch discharge onto NL Industries property

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This is NPDES Permit outfall 002. Collection pipes received surface and cooling water from the south-central portion of the site and conveyed it to a former open ditch that crossed onto the northeast corner of the NL Industries site (see the discussion in AOC C7 above). This ditch was formerly a tidal creek that has been

filled and channelized. No active discbarge to this ditch is known to originate at the ASARCO site. Plant demolition has filled the inlet structures and the former ditch. Further investigation is proposed in Section 5.8.

AOC D1-3: Open Pipe Discharge to Arthur Kill \_ 05 Fix 003

This is NPDES Permit butfall 003. This pipe collected surface and process water from the southeast portion pf the site. This pipe appears to be inactive due to plant demolition blocking the inlets. The open pipe is visible in Copper Slag Flip-Rap along Arthur Kill. Further investigation is proposed in Section 5.8.

AOC D1-4: Open ditch discharge to Arthur Kill ~ - ATTHE OF

This was NPDES outfall 004. At the time of permitting, this ditch collected surface run-off and cooling water fur a large area in the central portion of the site and conducted it to Arthur Kill. It was originally constructed as a salt-water supply, timber-cribbed flume that conducted water from Arthur Kill to a pump adjacent to the Copper Tank House in the central portion of the site. The salt-water pump supplied water for slag granulation, cooling and fire protection. Plant water demands exceeded the carrying capacity of the ditch, so the salt-water pump was first moved to the east end of the Aluminum Plant, then directly adjacent to the Pier. A 36-inch diameter suction line suspended underneath the Pier in 1928 replaced the ditch as a water intake point. Therefore, after 1928 the ditch became a discharge to Arthur Kill. This ditch still actively receives tidal exchange and flows east during low tide. Further investigation is proposed in Section 5.8.

AOC D1-5: Open pipe/Open ditch discharge to Arthur Kill OJ ね つら

This discharge was designated NPDES or fall 005. This pipe collected surface and process water from the northwest end, the Cooling cond surplus and the northern portion of the facility. This former discharge point occupied the location of a former tidal creek that is now filled. The discharge point was filled after 1990 and is therefore eliminated. Further investigation is proposed in Section 5.8.

## AOC D2-1 through -3: Waste Piles

One historic and two existing waste piles have been identified on the site. The largest of these, the slag dump, no longer exists as a pile because it was leveled and the area was subsequently put to various plant uses. The waste pile locations are shown on Figure 5A.

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The southeast corner of the site was designated as the Slag Dump by ASARCO from as early as 1919. This area was leveled between 1940 and 1951, with the surplus slag being relocated to the south side of Cranes Creek. At the same time Cranes Creek was channelized and straightened. The former slag dump was then used for the construction of oil bulk storage tanks, the brick storage shed and the salvage building. Open areas were used for yard storage on the graded slag surface. Area specific investigation of this AOC is not proposed. Rather, it will be addressed in the proposed completion of the site-wide fill characterization (see Section 5.15 below).

AOC D2-2: NL Industries baghouse rubble outside southern fence line

Between 1980 and 1990 during the ownership by Neuburne Brown, a large pile of baghouse demolition debris was placed outside the ASARCO fence line and adjacent to the NL right-of-way. These materials have been closely examined on two different-oecasions. Two distinct types of material are present, baghouse dekris and a gray fine-grained residue. Dutch Boy paint pigment containers have been identified in the gray residue, confirming the origin was from the NL site. Further investigation is proposed in Section 5.10.

AOC D2-3: Crushed building debris at the south fence line

At the close of plant demolition, excess crushed building debris was stockpiled for future beneficial reuse. The stockpile is located along-the seuthern preperty boundary as illustrated on Figure 5A. Railroad ties which had been stockpiled in this area following the removal of on-site rails are still present beneath the eastern portion of the building debris pile. The crushed building material was sampled during 2006 for characterization and eventual on-site reuse. A soil reuse proposal based on the sampling results will be prepared for NJDEP review and approval.

AOC D3-1, and -2

AOC - D3-1, and -2: Incinerators in west-central portion of facility

Two wire Incinerators were present in the west central portion of the facility (see Figure 6). These were operated by Federated Metals, a secondary metal smelting subsidiary of ASARCO. The function of these devices was to remove insulation from recycled electrical wire. Wire was fed through a large shear to cut it into a manageable form and then burned in oil-fired incinerators. After the insulation was removed, the copper was baled and sent to a melting process in either the Brass Plant or the Copper Casting House.

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Incinerator D1-1 was located on a large raised concrete platform next-to-the-wire cutting shear. The raised platform was used for scrap sorting and storage. The incinerator had been dismantled and removed prior to 1970. No evidence of a discharge is present in this area. Buried oil lines which fed the incinerator may still be present. Investigation of the oil lines is proposed in Section 5.4 below.

Incinerator D3-2 was located on a raised concrete platform at the base of the 1898 lead refinery emissions stack. Plant drawings and observations made during demolition suggest that a portion of this device was also used as a lead "sweater" furnace.<sup>32</sup> Ash from the incinerators was taken to the Slag Yard for disposal. This incinerator was dismantled by Inland pollution Services and the debns was shipped off-site as hazardous waste<sup>33</sup>. No visual evidence of a discharge is present in this location. Therefore, no further investigation is proposed.

AOC D4-1 through -8: Filled Areas (1886-1824) = OFasin Mansyland,

Site filling began in about 1894 to reclaim marshland for the construction of the first plant buildings. Filling continued through 1994. As a result of this historical filling, nearly the entire site is currently covered with some thickness of artificial fill material. This site wide blanket of fill has been designated AOC D4-8 and is discussed below. The extent of the site-wide fill is illustrated on Figure 5B.

Beginning in 1976, ASARCO conducted building demolition and started recycling the material for beneficial on-site reuse. This practice continued until 1994 when the most-recent demolition program ceased. This building demolition material was used site-wide for underlay of the road-millings cover, and to fill discrete basements and excavations. Seven of these discrete areas where thicker or contained accumulations are present have been identified (AOCs D4-1 through -7). They are discussed below and illustrated on Figure 5A.

AOC D4-1: Parting plant rubble ) ( counce T Clan Soil ( Usage

Between 1976 and 1979, the Parting Plant was demolished and the rubble was placed into the southeast portion of the Cooling Pond. This rubble was subsequently covered with clean soil by Bridgeview Management and planted with grass and trees. Area specific investigation of this AOC is not proposed. Rather, it

A low-temperature melting process that was used to separate lead shielding while incinerating the insulation of heavy electrical cable and to separate lead solder from early copper automobile radiators. Puddled, solidified lead would be collected from beneath a grate on the incinerator bottom for further processing, while the copper would be removed from above.

<sup>33.</sup> Site Stabilization Summary, May 1996.

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will be addressed in the proposed completion of the site-wide fill characterization (see Section 5.15 below).

## AOC D4-2: Copper tank house basement

During 1994 and 1995, the 4.5 acre Copper Tank House was evaluated for rehabilitation. During the evaluation period, the basement was filled with on-site debris and some structural fill brought from off-sife sources, in preparation for pouring a concrete floor at grade level. The evaluation showed the Copper Tank House did not meet modern architectural standards and it was subsequently demolished. The filled basement was then sovered with orushed building debris and road millings. Test pits into the fill material and monitoring wells are proposed (see Sections 5.14 and 5.16).

AOC D4-3-7 Warehouse basement

The warehouse was demolished before 1994. The basement was filled with on-site building debris and capped with road millings. Area specific investigation of this AOC is not proposed. Rather, it will be addressed in the proposed completion of the site wide fill characterization (see Section 5.15 below).

AOC 194-4: Parting plant excavation fill

Between 1976 and 1986 ASARCO removed the Parting Plant and engaged in practious metals recovery from both the building interier and from fugitive material which uriginated from spills in the building and accumulated in the underlying soil. The Parting Plant had occupied the same location from 1898 to 1976 and had produced over 3 million ounces of silver and 200 ounces of gold per month. An excavation was made to a depth of 15 to 20 feet using a clam-shell crane, and upon completion measured 75 by 150 feet. This steep-sided water-filled excavation was subsequently backfilled with crushed building debris and covered with asphalt millings. Two monitoring wells are proposed for this location (see Section 5.16).

AOC D4-5: Laboratory building rubble

Between 1976 and 1979, immediately after plant shutdown, ASARCO demolished the laboratory building because it was deteriorated. The building was pushed east, leveling the ground surface at the former building site, and bladed to create a gentle slope to the east. The former laboratory site was leased to Koch Asphalt for redevelopment in 1980. The building rubble is buried outside the former Koch fence area under soil and gravel and is overgrown with trees and brush. Large slabs of concrete are visible on the southern embankment of this fill. Test pits are proposed to investigate this material (see Section 5.11).

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## AOC D4-6: Saltwater pump bouse

During the most-recent demolition, Bridgeview Management filled this structure with crushed building debris. It was then covered with asphalt millings. Area specific investigation of this AOC is not proposed. Rather, it will be addressed in the proposed completion of the site-wide fill characterization (see Section 5.15 below).

AOC D4-7: Slag granulator pond

Based on aerial photographs, this feature was filled before 1940. The granulator pond last appears on a 1923 map, therefore it must be filled with site generated material. For further discussion of this feature see AOS C3-2. Area specific investigation of this AOC is not proposed. Rather, it will be addressed in the proposed completion of the site wide fill characterization (see Section 5.15 below).

AOC D4-8: Site-wide till Supple SLAC (Copy As 4) ROFERSON BLOG &

As has been stated before, nearly the entire site has been subjected to filling activity for over 100 years. Waste slag, coal ash, used refractory brick, and building rubble were all historically used as fill material in low-lying areas. The site was filled from west to east using these materials. These materials-were placed in a sequential manner, but each load was most-likely placed randomly) without any source segregation. Therefore the result is a heterogenous mixture of material with little or no spatial continuity. The result is the mapped distribution of artificial fill shown on Figure 5B. The metal-bearing) wastes, slag, ash and debris is by nature multi-colored and is not natural soil. This fill was noted to contain oily material at some locations and has been the subject of numerous NJDEP correspondence (see the discussion under "Other Spills" below).

Site-wide fill was investigated and the results were reported by Killam Associates during 1988. The sampling results have been previously reported to NJDEP and are in the April 2006 RIWP, Appendix G. The fill has been further investigated by JMZ Geology during 1994, '95 and '96 through the examination of test pits (see Appendix I), tank excavations (see Appendix F) and monitoring well installations. During 1995, three fill samples were collected from a trench on the north side of Building 17 (TR-1, Appendix I). Because the fill contained slag and fuel constituents, and in accordance with the Site Characterization Outline the samples were only analyzed for priority pollutant metals and total petroleum hydrocarbons.

Three additional samples collected from natural soils beneath fill during 1996 and were found to be below the applicable guidelines. Because they were "clean", those results have not been reported to NJDEP. The metal concentrations found in the fill are discussed further in Section 4.0. The site-wide fill will be further investigated



by-additional-fill-sampling-and-groundwater-investigatioo (see Sections 5.15 and 5.16 below).

## AOC D5 through D7: Other Spills and Discharges

AOC D5: Subsurface No. 6 oil soill ADJRES DO AMBUR Free (#6 Proc Occ.

A No. 6 oil spill has been defined in the subsurface adjacent to the Arthur Kill bulkhead and south of the Pier (see Figure 5A). This spill is the subject of the Remedial Action Workplan: No. 6 Oil Recovery, subrhitted to NJDEP and dated May 2006. This RAW is currently being revised by ASARCO.

AOC D6: Bunker C Surface Spill, 1971 250-3-4 Ghun

On November 16, 1971 a pipeline transferring Bunker C fuel from the neighboring Chevron bulkhead to the ASARCO storage facilities leaked and a discharge was reported to NJDEP.<sup>34</sup> The transfer pipeline was above-ground and the former location is shown on Figure 5A. The spill volume was estimated to be five or six barrels (corresponding to 250 to 300 gallons). On December 23, 1971 a Department memo noted that a cleanup had been completed by ASARCO. No further documentation is available.

The path of the transfer line is known, but the exact location where along this line the spill occurred is not. The location of the subject pipeline is shown on Figure 5A. The reference to the Department following up on the spill and a cleanup being completed suggests it will not be possible to locate the remnants of this spill. Therefore, no further investigation is proposed.

### AOC D7: Copper Slag Rip Rap

To the south of the pier and wooden bulkhead the shoreline of Arthur Kill is armdred with copper reverberatory furnace slag rip-rap (see Figure 5A). Aerial photographs show this material was in-place by March 1970. This slag rip-rap is composed of durable large sized pieces. No further investigation is proposed.

## **AOC D8: Undefined Discharges**

ASARCO has copies of seven different NJDEP and USEPA documents that provide information collected by regulatory authorities during site inspections of the ASARCO smelter property, the former South Property and the neighboring NL

<sup>&</sup>lt;sup>34</sup> Discussed in NJDEP Responsible Party Investigation memo dated November 28, 1989, pgs. 1 and 2.

Industries-site. None of these documents are complete, rhany of the descriptions and locations have been difficult to decipher due to missing maps, missing laboratory data and imprecise language. During the preparation of this discussion, we have carefully reexamined these documents and in one case by matching sample numbers, discovered that a map received as part of a recent OPRA request (see AOC A2-3 through -7 above) had been disassembled from its original text and was with UST registration documents. The map was restored to its original source, an October 24, 1981 NJDEP memo. This clarified the observations discussed in that memo.

#### The NJDEP memos are:

- January 29, 1990, Case Transfer Report, transfer to State Case Management, prepared by Lihda Goldsworthy, single page, provides a Case Level Determination D and a Priority Score of 11.7. Light copy, nearly illegible.
- November 28, 1989, Responsible Party Investigation, ASARCO, prepared by Carlton Dudley, Investigator, Bureau of Compliance and Technical Services, incomplete, missing attachments. Provides a concise review of: site history, a 1966 Industrial Waste Survey, NJDEP citations, NJDEP site inspections and potential RP's, based on the November 16, 1989 tenant occupancy.
  - September 18, 1986, NJDEP Site Inspection and Sampling, eleven samples were collected. Sampling was part of a Bureau of Site Assessment's Preliminary Assessment, Site Investigation, Hazard Ranking System evaluation. The cover memo dated June 15, 1987 notes that contamination is present and refers the case to Ronald Corcory, Hazardous Waste Enforcement. Map and field observations are included, laboratory data is missing.
  - October 24, 1983, USEPA Potential Hazardous Waste Site Preliminary Assessment, ASARCO, 1160 State Street, prepared by Robert Hayton, NJDEP HSMA, incomplete, missing attachments. This appears to be based upon the 1981 memo below.
- October 24, 1981, NJDEP Hazardous Waste Investigation, ASARCO, 1160 State Street, prepared by Tom Downey, memorializes a three day site examination with 12 sample locations. Two NJDEP employees were escorted by former ASARCO employees and Neuburne Brown employees who provided information on former site activity and explanations on the process of removing various waste materials.

Complete data missing, map only recently identified. Based upon a September 24, 1986 letter from John Trela to Goldshore & Wolf, Attorneys at Law, only two of these samples were analyzed.

- January 24, 1978, Oil and Hazardous Materials Spill Report, prepared by S. W. McCone, OHMP Case # 78-1-13-1, provides no further action result to report of dumping. The report refers to a landfill, which is the South Property (the former slag yard) now owned by Kinder Morgan, Inc., and part of the Perth Amboy Redevelopment Authority project.
- October 8, 1976, Oil and Hazardous Material Spill Report, with attached memorandum, prepared by William Althoff. OHMP Case #76-9-10-1. Details a site inspection of the South Property, not this site.

Reexamination of the file information confirms that filling with metal-bearing wastes had occurred over a long period of time. NJDEP representatives note metal-bearing wastes and oily discharges on both soil and surface water bodies. In addition, effluent discharges to surface water and soil were occurring at the time of some site inspections. Most inspections group the South Property and Smelter Property together, because they were at that time one large facility. The South Property has been the subject of a Preliminary Assessment and Remedial Investigation conducted in accordance the 1994 MOA and approved by the NJDEP. The results have been provided to the NJDEP in an RI Report dated June 2003. The surface water discharge locations from both the Smelter site and the South Property have been proposed for surface water, groundwater and sediment sampling in the RIWP.

The October 24, 1981 memo by Tom Downey details a number of observations and provides analytical results. Many of the sampling locations and observations are within buildings and diked impoundments. It is noted that representatives of ASARCO were conducting a cleanup of spilled oil in the Bulk Oil Tank #3 impoundment (AOC A1-3) at the time of the inspection. The wording of the memo indicates that ASARCO representatives and Neuburne Brown employees had invited the NJDEP on-site because they were looking for direction on how to proceed with a general site-wide cleanup. We know from first-hand interviews with former ASARCO employees Barry C. Harris, Steven Chizsar and Roland Gregg, that ASARCO did perform cleanup activities from 1976 to 1981. It is also apparent that representatives of Neuburne Brown took on the responsibility for removal of hazardous substances which they considered to be products with value. In addition, Neuburne Brown reportedly later removed underground storage tanks (see AOC A2-8 through -15).

The memos provide general information concerning site conditions as observed during the 1970s and 1980s. However, due to the incomplete condition of most of

the records, imprecise or missing maps, little area-specific information can be derived from them. Furthermore, many of the referenced areas inspected and sampled, have subsequently been removed or altered beyond recognition. Therefore, no further investigation of these areas is proposed.

### 3.5 Part E: Other Areas of Concern

## AOC E1-1 through -6: Transformers

Five transformer locations have been identified at the site. A sixth location formerly containing four rectifiers was also misidentified as a transformer location. These are all described below and illustrated on Figure 7. Based on the former distribution of metallurgical processes throughout the site, we assume that many more interior transformers, capacitors, switchgear, etc. were also present in the past. However, no historic site maps or drawings illustrating the former electrical equipment locations have been examined.

ASARCO engaged in a corporate-wide program of wet transformer and capacitor identification during the 1970's ASARCO contracted with General Electric Corporation to take dielectric fluid and transformer carcasses for off-site disposal. A concerted effort was made to locate und aliminate as many devices as possible which contained greater than 50 ppm PCBs. No documentation for this activity has been located for the Perth Amboy site.

Memos<sup>35</sup> indicate that Neuberne Brown removed electrical equipment including transformers between 1981 and 1991. No maps illustrating these locations or any other documentation of this work has been found.

Additional transformers were removed by IPSI during the building demolition conducted by Bridgeview Management. Each location was evaluated and examined for evidence of a discharge. Dielectric Nuid was analyzed and proper disposal was conducted. Documentation of this activity was submitted to the NJDEP in the Site Stabilization Summary, dated May 1996. Since demolition is complete and no evidence of these former transformer locations is evident, no further investigation is proposed.

# AOC E1-1: Former transformer enclosure and electrical building

This AOC is located at the west end of the site, to the west of the former alloy plant. It formerly consisted of a fenced enclosure which contained four

<sup>&</sup>lt;sup>35</sup>. Interoffice memos dated May 13,1982 (To: Bob, From: Paul), and May 27, 1982 (To: Neuberne Brown, From: Robert W. Eitzen).

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transformers<sup>36</sup> and a brick building. Only the building is currently present. We have examined this location and found the existing transformers are all inside the building. No transformers or any trace of the exterior transformer mounting pads is currently visible. The former enclosure has been covered with crushed brick and graded. There is no evidence of discbarges inside the building, on the building exterior, or within the formerly enclosed area. However, because the original surface is not currently exposed, further investigation is proposed.

AOC E1-2: Four "transformers" west of power house

This potential AQC was ideptified by BB&L. The four units formerly present at this location were rectifiers<sup>37</sup> net transformers or cagacitors. Rectifiers are "dry" devices and do not contain PQB oils. This area is not, therefore, an environmental concern.

# AOC E1-3: Transformer to the west of Building 1

The transformer behind Building No. 1 was examined and found to be a Wagner Electric Corporation device. A manfactuer's label says it contains 410 gallons of Type 7N transformer oil. An internet search for the oil type shows this is a non-PCB oil. There are no signs of a discharges on the transformer pad. Therefore, no further investigation is proposed for this AOC.

# AOC E1-4: Transformers inside Building 8

Fourteen transformers are located on the second floor interior of Boilding No. 8 (former allow plant). No evidence indicating a discharge of dielectric fluid to the environment is present. Therefore, no further investigation is proposed.

## AOC E1-5: Transformer in slag yard

A single transformer is located on and near the center of the former slag dump, adjacent to the bulk storage tank pads. The transformer is not currently connected to a power supply and it is labeled as PSE&G property. It is resting on a manufactured metal secondary containment pad. ASARCO is contacting PSE&G and will have this device removed from the site. No further investigation is proposed.

<sup>&</sup>lt;sup>36</sup>. Community Design Associates Map No. BN-33R, 2/28/1991, Survey of Lot 1.04, Block 428 & Lots 1, 1.01, 2, 3, & 4, Block 430.

<sup>&</sup>lt;sup>37</sup>. ASARCO Drawing No. 16196-A, 3/24/1966: Plant Map Showing Building Numbers.

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## AOC-E1-6:-Transfermer-at-former-Arlington-Lead-facility-

The transformer adjacent to the former Arlington Lead facility (Bridgeview Building No. 2) was evaluated during the Arlington Lead Burning ISRA case (Case No. 92526). It is owned by PSE&G and has no syidence of a discharge. Therefore, this transformer is not considered to be of ceficern and no further investigation is proposed.

## AOC E2-1 through -4: Waste Treatment Areas

In general, waste treatment practices were not employed at the plant. The waste material produced in the highest volume was slag which, as noted previously, was used as fill on-site and on the adjacent South Property. Other byproducts of the plant were either further processed and refined on-site, shipped to bther ASARCO facilities for further processing, or sold to other end users.

However, four historical operations locations which may be considered waste treatment areas, in the broadest sense of the term, have been identified. These are three slag granulator pits and a series of acid neutralization tanks in the parting plant. Each is discussed below and illustrated on Figure 7.

## AOCs E2-1 through -3: Slag granulator pits

Three slag granulator pits are shown on a 1923 drawing<sup>98</sup>. Two of the pits were located in the original tin piant (E2-1 & -2) and the third was located to the south of the lead blast furnace (converter building) (E2-3). The granulator pits were concrete basins in which hot slag was shattered by dousing with cold water. The granulated slag was then transported to the slag yard either by truck or by pipeline. Excess water from the pits was discharged to the storm sewer system. The discharge from the slag granulator pits will therefore be evaluated in the NPDES outfall sampling (see AOC D1-1 through -5 and Section 5.8 below).

## AOC E2-4: Parting Plant acid neutralization tanks

The exact location of these tanks within the parting plant is unknown. They were identified on a single process flow chart<sup>98</sup> which does not provide a specific location. Wash water from the parting plant operations was passed through a series of cascading tanks to remove any remaining silver and copper. From there, the

<sup>&</sup>lt;sup>38</sup>. See note 27.

<sup>&</sup>lt;sup>39</sup>. ASARCO Drawing No. FS-15347-A, 5/14/1959: Lead Refinery - Cupel Dept. Retort and Parting Plant Pictorial Process Flow.

acidified water was pumped through a series of tanks filled with crushed limestone to neutralize the acid before being discharged to the sewer. The parting plant location was fully excavated prior to 1986. The parting plant acid neutralization tanks will therefore be evaluated in the NPDES outfall sampling (see AOC D1-1 through -5 and Section 5.8 below).

## AOC E3: Open Area Away From Production Areas

As Figures 1A through 6 demonstrate, the entire 70.4 agree site was occupied by precessing and production areas, or ancillary materials storage and handling areas. The only part of the site which might be considered "away from production areas" is the 50 foot wide easement at the south property boundary. Although this area contained no buildings, it was not used by ASARCO and was separated by a fence from ASARCO production areas. It did contain two rail lines used by National Lead (NL) to access their dock on the Arthur Kill.

Between 1980 and 1990, during the ownership by Neuburne Brown, a large pile of baghouse demolition debris containing materials clearly derived from the NL site was placed in this area (see AOC D2-2). Additional investigation of this material is proposed in Section 5.10.

## **AOC E4: Stressed Vegetation**

BB&L noted a small patch of stressed vegetation to the east of Building 1 (see Figure 7). The location is within an intensely used former rail-yard area. Most recently, the location was a gravel-covered storage yard. In this area, ash fill has been documented to a depth of greater than 8 feet (see April 2006 RIWP, Figure 6). None of these conditions are conducive to vegetative growth. The vegetation represents pioneer growth in an area that is not currently in active use. The cause of the vegetative stress is obvious and no further evaluation is proposed.

#### AOC E5-1 Through -6: Stained Areas

BB&L identified five areas of stained soil on-site. We have examined each of these potential AOCs and have found that some of them warrant further investigation. In addition, a stained area was addressed during the Arlington Lead ISRA cleanup. A discussion of each is provided below, the locations are shown on Figure 7.

### AOC E5-1: Staining by building 16

This surficial staining results from Texas Pipe, a former tenant. The stains result from kerosene used as a cutting fluid and hydraulic oil. The stained material

consists of asphaltic millings over and intermixed with ash, cinder, and slag fill. Further investigation is proposed in Section 5.12.

## AOC E5-2: Staining by KT Marine ASTs

As noted above (AOC A1-35 & 36) stained soil was observed near the northeast corner of the site, near an AST. The stains result from fueling by KT Marine, and the stained material is asphaltic road millings over slag. This area is monitored by wells MW-11s and -11d. This area will be further addressed in the evaluation of ASTs (see Section 5.2).

AOC E5-3: Staining at building 17

Building 17 houses Viking Marine, Inc. Oil stains are evident on solid concrete and the building wall; no soil staining is present. This is a housekeeping issue which ASARCO has addressed with the tenant. These stains do not represent a discharge to the environment and therefore are not an area of concern.

AOC E5-4: Staining at south side of building 2

This area is completely paved. The oil staining is on pavement and results from the repetitive parking of vehicles in the same orientation. These stains do not represent a discharge to the environment and therefore are not an area of concern.

AOC E5-5: Staining by building 1

This staining is associated with an existing, in-service AST and was discussed above under AOC A1-33. It will be addressed in the evaluation of ASTs.

AOC E5-6: Historic staining at Arlington Lead — My 50

This area was located on the west side of the Arlington Lead building. The affected soil was excavated in two phases in 1993 and 1994 during the implementation of remedial actions under ISRA Case No. 92526. Both lead and petroleum hydrocarbons are present above current standards in soils beneath the building footing. Based on the results of the post-excavation samples and the presence of a structure over the remaining contamination, a recommendation of no further action was made. NJDEP issued a No Further Action (NFA) approval letter for the Arlington Lead facility on May 21, 1997. Documents pertaining to the Arlington Lead cleanup, including the remediation of the stained soil, were provided as Appendix J of the April 2006 RIW. No further action is proposed for this AOC.

## AOC E6: Misidentified Production Wells

No known active or inactive production wells are present at this site. However, an 1898 Sanborn Map of the facility shows a group of "driven wells" located near the center of the facility. These wells do not appear on any of the other historic site drawings and maps we have found. Therefore, for the reasons outlined in the Introduction, we suspect that they were a misplot on the part of Sanborn.

In a letter dated September 7, 1999, ASARCO replied to a NJDEP Bureau of Water Allocation request for information regarding the wells shown on the Sanborn Map. A copy of the letter is provided in Appendix H. This response was followed by a telephone conversation and so far this response has satisfied the NJDEP. No additional investigation is proposed.

## 3.6 Part F: Building Interior Areas With Potential for Discharge

As previously noted, because most of the former buildings have been demolished, the majority of the identified AOCs are historic features that are no longer present on the site. The absence of buildings makes the evaluation building interior AOCs especially difficult.

## AOC F1-1 Through -5: Boiler Rooms and Boiler Houses

One existing boiler room and four historic boiler houses have been identified. Each is discussed below; locations are shown on Figure 7.

## AOC F1-1: Original coal-fired boiler house

This location was originally west of the lead refinery. It was a coal-fired plant that supplied the entire facility with steam. Fuels were stored outside the building in hoppers and bins. Sanborn maps incorrectly plot the location of this building and label bins as "silos". Coal was conducted into the boilers by conveyors and an automatic stoking system. Waste residue was taken out by narrow gauge rail to the slag dump. This building was razed after the construction of a new boiler house in 1937. Area specific investigation of this AOC is not proposed. Rather, it will be addressed in the proposed completion of the site-wide fill characterization (see Section 5.15 below).

#### AOC F1-2: 1937 Oil-fired boiler house

The later boiler house served the plant from 1937 until shutdown in 1976 and was subsequently demolished. This building was constructed on the site of the former coal-storage and handling system for the original boiler house. Bunker C fuel oil for

the new boiler house was stored in bulk oil tanks 2 and 3 (AOCs A1-2 & -3) and in the twin oil tanks (AOC A2-11). Oil was conducted into fhe building by overhead insulated pipelines. Water was suppled by the city water lines, waste boiler water was conducted to the plant storm system and was ultimately discharged to Arthur Kill. Area specific investigation of this AOC is not proposed. Rather, it will be addressed in the proposed completion of the site-wide fill characterization (see Section 5.15 below).

## AOC F1-3: Existing Boiler room in Building 4

Building 4 was fitted with a No. 2 fuel-oil fired boiler. The tank was removed during 1994 (AOC A2-14) and the boiler was converted to gas. A floor drain in this boiler room is connected to the municipal sanitary sewer. Visual observation found no evidence of a potential discharge associated with this boiler room.—Therefore, no further action is proposed.

### AOC F1-4 and -5: Historic waste heat boiler houses

Two historical waste heat boilers have been identified. One was located in the original tin plant (1923 map) and one was to the north of the pepper casting house (1902 sections). Rather than burning fuel, these boilers utilized excess heat from process furnaces to generate steam. Because no fuel consumption was involved, no further action is proposed.

#### AOC F1-4: Waste heat boiler, former Tin Plant

A small boiler that used waste heat produced by a tin blast furnace was present in the area later converted to the Brass Ingot Plant. This boiler did not require an independent burner or fuel source. The building was serviced by the plant sewer system. Because no fuel consumption was involved, no further investigation is proposed.

## AOC F1-5: Waste heat boiler, former Copper Casting Building

A small boiler that used waste heat produced by the copper reverberatory furnaces was present on the north side of the copper casting building. This boiler did not require an independent burner or fuel source. The building was serviced by the plant sewer system. Because no fuel consumption was involved, no further action is proposed.

## AOC F2: Air Vents and Ducts, Including Flues

Over 106 individual stacks and vents were mapped by ASARCO engineering staff in 1974 which were grouped togethet into over 54 designated uses in 17 buildings. Of these, 13 stacks-were labeled as obsolete. ASARCO Drawing No. 17507-A, which shows all of these stacks and vents is provided in Appendix A.

The apparatus serviced by these vents and ducts are nearly all removed and the buildings have been razed. Only five buildings remain that have mapped air ducts and stacks, but the processes in these buildings ceased in 1976. These five remaining buildings are:

High and Low Grade Sampling Department (Building 5): Furnace Room Alloy Plant (Building 8): Baghouse and Furnaces

Lead Products (Building 2): Melting and Softening Furnaces

Refined Copper Casting (Building 1): Casting Furnaces

Shops Building (Building 15): Blacksmith's Forge

Roof runoff from all of these buildings was either conducted to the ground surface or to the plant sewer system. The ultimate discharge point for the run-off was Crane's Creek and/or Arthur Kill (AOCs C6-1 and -2) by the plant drainage system through the five NPDES outfalls.

Four areas were serviced by high temperature fume handling flues. These were: the Brass Plant Building, Lead Refinery, Converter Building (Lead Blast Furnace), and the Roaster Building (Aluminum Plant). Historic flues associated with these buildings are illustrated on Figure 7.

The flue systems were designed to recover metal particulates from the combustion gases and to precipitate vapor-phases that had formed in the process. The flues were horizontal, some contained baffles, settling chambers and cooling systems using water mists. Prior to exhausting to the atmosphere through emission stacks, the cooled gasses were passed through baghouses up to 3 stories high with cloth filtration bags that caught the dust particles. The dust was recycled for metal reclamation. Depending upon the process, the dusts were pelletized and used as furnace feed, or leached to recover soluble fractions. Some baghouse dusts were shipped to other ASARCO facilities for further processing.

All of the flue systems were dismantled during the plant shutdown and subsequent demolition. These systems were either sent for metal recovery by Neuburne Brown, or were sampled then sent off-site as either non-hazardous or hazardous waste by Bridgeview Management. The brass ingot plant stack and the aluminum plant stack were sampled for waste characteristics after demolition and based upon the results

were crushed and used as on-site fill. The brass plant baghouse and blast furnace baghouse were part of the fume handling systems and these were taken off-site as hazardous waste. The sampling results and hazardous waste manifests have been provided to NJDEP in previous documents<sup>40</sup>.

Area by area investigation of these AOCs is not proposed. Rather, the possible affects of emissions or discharges resulting from them will be addressed in the proposed completion of the site-wide fill characterization (see Section 5.15 below).

## AOC F3: Building Imerior Hazardous Material Storage or Handling Areas

As noted previously under the discussion of loading and unloading areas (AOC A4), nearly all buildings at the site handled hazardous materials. Exceptions are offices, lunch rooms, showers, hose sheds, and lumber storage sheds. As a result, every process building interior is considered to be a hazardous material storage or handling area. Because most of these buildings have been demolished, the majority of the interior hazardous material storage or handling areas are longer present. All known and suspected interior hazardous material storage or handling areas have been mapped in a general fashion on Figure 7.

In the parting plant and the copper tank house, electrolytic refining processes were conducted. These processes had a greater potential for releases of hazardous materials to the environment due to the acidic solutions employed. The parting plant was demolished and the underlying soil removed in order to recover gold and silver that had escaped the building confines. The copper tank house represents a large area where large quantities metal-bearing acidic liquids were handled. Further groundwater investigations are proposed in each of these areas.

Materials handled in individual spaces shown on Figure 7 and shown in the process diagrams are:

Brass Plant: **S**crap brass, refinery brass, irony brass, irony copper, brass skims, blister copper, zinc slag, melt slag, copper slag and baghouse dust.

Brass Plant Baghouse: baghouse dust and zinc oxide.

Lead Refinery: Lead bullion, eutectic and low antimony metal, lead drosses, clean litharge, caustic soda, sodium nitrate, tin, tin tetrachloride, indium, copper dross, caustic lead skims, zinc dross, bismuth dross, zinc chloride and lead slag.

<sup>&</sup>lt;sup>40</sup>. See: Site Stabilization Summary - Addendum to Remedial Investigation Workplan, May 1996.

Cupeling and Retorting: lead desilverizing crusts, slab zinc, dore (mixed gold and silver) bullion, zinc, lead, clean litharge, copper refinery leached slimes, selenium soda slag, dore sweeps, dore sludges, selenium and tellurium soda slag, dirty litharge and sharp slag.

Converter/Blast Furnace: pelletized baghouse dust, lead softener skims, lead dross, tin dross, antimony first dross, purchased lead ores, coke, lime rock, purchased battery plates, high antimony slag, metallic iron, sodium nitrate, caustic soda, sulfur, lead chloride, copper dross, copper matte, copper crystals, antimony oxide, and eutectic (lead and antimony) metal.

Blast Furnace Baghouse: Baghouse dust and arsenic oxides.

Copper Castirg: Blister copper, copper anddes, baled copper wire, anode-scrap, copper cleanings, slag and hand-sorted copper cobbings.

Copper refining: Sulfuric acid, copper sulfate, lead anodes, copper, lead anode scale, sludge, crude nickel sulfate, refined nickel sulfate, cadmium, electrolytic tin, precious metal slimes, black (spent) acid.

Scrap Plant: brass, lead and copper scrap, No. 1 copper, No. 2 copper, incinerator ash.

In addition, fuel oil, coal and coke were used in most of these processes to generate heat, and in some cases with coal or coke covering molten metal in kettles in order to exclude contact with air.

Materials listed from site inspections and building cleanout are:

Warehouse: asphalt paint, muriatic acid, phosphorus, solvents, phenolic binders, barium sulfide. Other materials such as lubricants were stored, but no further information is available.

Koch Materials, Building 7: Asphalt testing on small samples. Koch Materials has moved off-site and has conducted a cleanup under ISRA Case #E20040142. Koch stored its raw material and products in tanks discussed in AOC A1-14.

KT Marine, Building 15: Diesel fuel additives in two 55 gallon drums, gasoline in 5 gallon cans for chainsaws and small pumps. This space is now vacant. Formerly an ASARCO Maintenance department storing incidental paints, cleaners, and lubricants.

Solar Laminations, Building 8: Polyurethane, solvents (unspecified), paint thinner. Solar Laminations was closed under ECRA Case #914b6 and received an NFA dated March 5, 1992.

Texas Pipe, Building 16: Kerosene, 110 gallons stored in drums. Texas Pipe is no longer on site and has removed their equipment and supplies.

Current tenants store limited hazardous substances indoors. These are:

M.O.M.I., Inc., Building 11: Gasoline in 5 gallon cans for lawn mowers and weed whackers.

Gerard Warehouse, Building 9: paint, acrylic patch, "Plexichrome", Decolor MP Classic, aluminum paste and Plexipave, all stored in 55 gallon drums, waste oil tank diesel fuel.

KT Marine, Building 10: Hydraulic oil in 55 gallon and 5 gallon pails, gasoline in 5 gallon cans for chainsaws and portable pumps.

ASARCO, Building 15: Approximately 15 skids of bagged lime remain from the former smelter operation.

Viking Marine, Building 17: Hydraulic oil, 110 gallons in 55 gallon drums.

Materials not listed above, but used in older process that were replaced prior to 1950 are:

Sulfuric Acid Plant: Pyrite (iron sulfide), coal, lead, fluorite (calcium fluoride), hydrofluorsilicic acid, bismuth.

Roaster/Aluminum Plant: lead ore (lead sulfide), coal, coke, arsenic, nickel sulfate, sodium chloride, chlorine and aluminum.

Electrolytic Lead Refinery: hydrofluorsilicic acid and lead.

Finally, not shown on any drawing, or discussed in any documents for this site are lubricating oils and greases. Grease and heavy oil used on chains, bearings, slides and other moving parts were stored in small quantities near the point of use and most-likely in the warehouse.

Area by area investigation of these AOCs is not proposed. Rather, the possible affects of on-site storage, use, and processing of the various materials stored and

handled in each will be addressed in the proposed completion of the site-wide fill characterization (see Section 5.15 below).

3.1 Part G: Any Other Site-Specific AOCs

Three additional site specific AOCs have been identified. These are the former power house, the former gas producer house and site-wide groundwater. The locations of these AOCs are shown on Figure 7. A discussion of each is presented below.

#### AOC G1: Former Gas Producer House

The former gas producer house was located to the north of the lead blast furnace. It appears orily on a site drawing dated 1902<sup>41</sup>. Its absence from even the most detailed later site maps suggests that it was only in use for a short period of time at the beginning of plant operations.

Producers generate gas from coal or coke by a process of partial combustion in a closed vessel. The only waste produced is a relatively small quantity of ash, no coal tar or tar oil is generated. Ash from the producer house is assumed to have been used as site fill material. Additional investigation is proposed.

#### AOC G2: Former Power House

The former power house was located immediately adjacent to the south side of the copper tank house. The power house used steam to generate the DC current necessary for electrolytic metal refining operations. DC current was used in both the copper tank house arid the parting plant. AC power was purchased from Public Service Electric and Gas. Later site rnaps (see AOC E1-2 above) show a group of rectifiers located to the west of the power house. The presence of the rectifiers indicates that power conversion was performed on-site at that time.

The power house contained a series of steam-powered generators which consisted of a belt-driven dynamo connected to a steam engine<sup>42</sup>. Steam was originally generated in a coal-fired boiler house (AOC F1-1) and pumped to the power house. This was later replaced (about 1937) by an oil-fired boiler system (AOC F1-2). In



<sup>&</sup>lt;sup>41</sup>. ASARCO Drawing No. 1765, March 3, 1902, Sections Through General Plan.

<sup>&</sup>lt;sup>42</sup>. ASARCO Drawing No. 1765, March 3, 1902, Sections Through General Plan.

1976 the power house was taken out of service and building was slated for demolition 43. Additional investigation is proposed.

AOC G3: Site-Wide Groundwater

The PA Report Form Question 5 Table provides for inclusion of groundwater as an AOC under the heading of Any Other Site-Specific AOCs. Groundwater coritamination is known to be present at the site and therefore, groundwater is a recognized as an AOC. Previous investigations have included preliminary evaluations of the Site groundwater quality. Table 1 provides a summary of the most recent (October 2000) groundwater sample results. Tabulated Analytical results from the earlier groundwater investigations were provided in Appendix G of the April 2006 RIWP.

A total of twenty-five wells have been installed on the Site in investigations conducted from 1985 through 2000. The locations of these wells are illustrated on Figure 8. The most recent of the groundwater investigations<sup>44</sup> prior to this proposal included tidal studies and slug testing. Using the methods outlined in Serfes (1991) groundwater flow was determined to be primarily from west to east across the property.

As noted above (AOC C3-1), the former cooling pond is in communication with groundwater. The cooling pond provides hydraulic head which significantly influences the speed and direction of groundwater flow and thereby contaminant migration to Arthur Kill. Elimination of the cooling pond is the single most effective means of slowing the movement of contaminant mass from the site to the surrounding environment.

Further investigation of groundwater is proposed in Section 5.16 below

#### 4.0 JUSTIFICATION FOR AN ALTERNATIVE INVESTIGATION

Due to the large size, complex history of the site, and the overlapping or superposition of AOCs, an alternate investigation method is proposed in accordance with NJAC 7:26E-1.6(d) and outlined in the Alternative Investigation Workplan (AIWP) presented in Section 5.0. This AIWP fulfills the requirements of 7:26E-1.6(c)3i-vi. Specifically, the AIWP utilizes a methodology that:

<sup>&</sup>lt;sup>43</sup>. ASARCO Drawing No. 16196-A, 3/24/1966, rev. 1976: General Plan Map Showing Building Numbers (with "Building Status as of October 1976").

<sup>44.</sup> See: Remedial Investigation Report: Site Hydrological Study, JMZ Geology, June 2002.

- has been successfully used and approved by the Department in similar situations<sup>45</sup>;
- reflects current technology as documented in peer-reviewed professional journals;
- will provide results that are both verifiable and reproducible;
- will achieve the same objectives as the methods outlined in the NJAC 7:26E;
- will further the attainment of the goals of the remedial investigation phase;
- will ensure the remediation of the site in a manner which is protective of human health and the environment.

An alternative method of investigation meets the requirements for remedial investigations outlined at NJAC 7:26E-4, it is in accord with the definition of "remedial investigation" at NJAC 7:26E-1.8:

"Remedial investigation" means actions to investigate contamination and the problems presented by a discharge.<sup>46</sup>

The proposed AIWP is based upon site characterization and not on point-by-point evaluation and delineation of each AOC. However, each known area of concern has been identified (in the AOC by AOC discussion above) and has been considered for sampling which would provide data that will advance the remedial action selection for the site. Sample locations have been selected to address these areas as necessary. No new technology is proposed. Rather current accepted and widely used methods of investigation and analysis will be used.

<sup>&</sup>lt;sup>45</sup>. Other New Jersey sites for which the proposed investigation method has been approved and successfully employed include: Kearny Smelting and Refining Corp., Kearny; Interstate Metals Separating Co., Kearny; Port Imperial South, Weehawkin; Liberty State Park, Jersey City; American Ref-Fuel Co./Essex County Resource Recovery Facility, Newark.

<sup>&</sup>lt;sup>46</sup>. Former versions of the definition included the following: "The remedial investigation emphasizes data collection and site characterization, and is generally performed concurrently and in interactive fashion with the remedial alternative analysis. The remedial investigation includes sampling and monitoring, and includes the gathering of sufficient information, to determine the necessity for remedial action and to support the evaluation of remediation alternatives."

<sup>&</sup>lt;sup>47</sup>. This is entirely in keeping with the November 1994 agreement as summarized in a November 23, 1994 letter from Bridgeview Management to NJDEP Assistant Commissioner Gimelio: "At the suggestion of Mark Pederson [of NJDEP], we will cail the data collection phase a Site Characterization. As we agreed, the Site Characterization will not address every potential area of environmental concern, but rather will consist of the collection of data to confirm the types of contaminants that are present at the site."

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Sections 2.0 and 3.0 above have listed and presented an evaluation of the known historic and existing AOCs on the site in accordance with the format provided in the NJDEP Preliminary Assessment-Report Form and the protocol outlined in the Technical Requirements for Site Rerhsdiation (7:26E-1.8, 3.1, and 3.2). By this process, a total of 153 individual AOCs in 39 categories set forth in the PA Form have been identified.

The majority of the AOCs are historic features related to buildings and processes which are no isoger present. All of the AOCs have been plotted as accurately as possible on site maps showing the historic on-site buildings (Figures 3 through 7). In some cases the precise locations of the AOCs cannot be field located with a high degree of confidence because the associated structures are no longer present.

Of the 153 AOCs identified, 113 are recommended for no further action with 40 \_\_\_\_ subject to proposed investigation. These 40 AOCs are further combined into groups for investigation because of historic and current site conditions. The grouping for investigation is further discussed in Section 5.0.

The history of the ASARCO Perth Amboy plant is effectively summarized by Figure 2A which shows the historic building locations. As has been noted in this and previous documents, throughout ASARCO's former operations at the site all available space was utilized either in metals processing, storage, handling, or support operations ancillary to metal production. Through time, buildings were demolished, replaced or expanded and modified in accordance with production needs. This resulted in changes to the processes used, the addition of new processos, and the caaation of obsolete or uneconomic production techniques.

The smelting and refining of non-ferrous metals from ores and fluxes preduced inorganic waste residues that were used aceite fill to create new production space. The inorganic nature of the raw materials, intermediates and products resulted in the outside ground storage of many inetal-bearing substances. The mechanical loading of these materials resulted in mixing with the underlying site fill. The high-temperature processing required to produce the metals were not sensitive to the inclusion of minor amounts of rocks, dirt pr slag, so foreign material was acqeptable. Some processes required the addition of silica, lime rock, other earth materials and even slag to facilitate the chemical reactions at high temperature.

The ASARCO facility had a high-tonnage throughput which resulted in the creation of a high-tonnage of slag-waste. Slag was considered to be inert and thus was used on-site as fill, railroad ballast, road metal and at times concrete aggregate. Certain thermal processes could only be conducted when a large enough mass of metal dross was accumulated. Therefore the ground storage of the metal-bearing intermediates could take place over the period of many months. Only when an

appropriate amount of material was present and the necessary flux was available, would a particular furnace be modified to handle a specific metal production "campaign" (a term the metallurgists used to describe a specific furnace run).

Furnaces, flues, burners, stacks and kettles are all either lined or bedded in temperature resistant refractory clays and brick. These materials entered into chemical reactions at high temperatures causing corrosion of surfaces and loss of insulating capacity. As a result these liners were routinely changed, creating a metal-bearing waste that was used as fill with the slag and was considered to be inert.

Coal and coke fuels were used prior to 1940 for most all processes, after 1940 both light and heavy oil were used for a flame source in most of the thermal treatment. The resulting coal combustion residue contains both metals and organic constituents. The combustion residues were also used as fill and were considered to be inert.

As the plant changed and developed the repeated construction, demolition, and site filling combined to create a mechanically mixed fill layer with a heterogenous composition, but that was uniformly metal-bearing and containing organic fuel constituents. Subsequent demolition and movement of heavy equipment across the site has promoted both further mixing and heterogeneity. This metal-bearing fill is now present over the entire 70.4 acre site with no practical way of removal and a low probability of identifying "hot spots", other than free-product fuel spills or former tanks. Figure 1 demonstrates that the identified AOCs are superimposed in a dense layering creating effectively a single AOC, which extends over nearly the entire property. Historical soil samples collected at the site provide the following range of metal concentrations in the fill:

Metal:	Concentration (mg/kg):	Location:	Date:
Antimony	ND - 5,160	B-6, B-13	1988
Arsenic	ND - 13,000	B-8, B-6	1988
Beryllium	ND - 65	B-1, B-13	1988
Cadmium	ND - 390	B-1, ERT-2	1988, 1981
Chromium	ND - 155	B-3, S106	1988, 1987
Copper	ND - 143,000	B-1, B-13	1988
Lead	488 - 208,000	B-3, B-2	1988
Mercury	0.31 - 16.5	B-10, B-1	1988
Nickel	ND - 1,300	B-3, B-13	1988

Selenium	ND - 2,000	B-6, B-13	1988
Silver	ND - 250	B-2, B-14	1988
Thallium	ND - 7	B-2, S-101	1988, 1987
Zinc	ND - 32,200	B-3, B-5	1988

Note: Sample locations are shown in Appendix I.

The high concentrations for five metals result from boring B-13, in the area of the Brass Plant storage yard. These concentrations appear to result from a baghouse dust, dross, or other intermediates. The B-13 coricentrations are higher for copper than is typical for slag. The high concentration for lead of 20.8% is also higher than is expected for slag. Boring B-2 was located within the former lead refinery operational area.

Results from 25 slag samples collected from the South Property disposal area and reported to NJDEP in June 2003 show the following ranges in metals for the waste products:

Metal:	Concentration (mg/kg):	Location:	Date:
Antimony	37.4 - 4,900	PB-6, PB-15	9/2002
Arsenic	75.5 - 16,300	PB-6, PB-16	9/2002
Beryllium	ND - 15	PB-16, PB-5	9/2002
Cadmium	ND - 648	PB-26(F), PB-16	9/2002
Chromium	ND - 2,300	PB-17(F), PB-6	9/2002
Copper	245 - 58,100	PB-15, PB-8(F)	9/2002
Lead	306 - 23,900	PB-6, PB-2	9/2002
Mercury	ND - 45.7	PB-6, PB-15	9/2002
Nickel	0.29 - 62,000	PB-6, PB-16	9/2002
Selenium	ND - 2,640	PB-6, PB-22	9/2002
Silver	ND - 276	PB-6, PB-3	9/2002
Thallium	ND - 56.7	PB-8(F), PB-3	9/2002
Zinc	1,600 - 28,500	PB-6, PB-23(F)	9/2002

Note: Sample locations are in the South Property RIR, June 2003.

Examination of the above table shows the wide range of metal concentrations present in slags and residues placed into the South Property slag yard. Comparison

of the two tables show that some slag residues have a comparable concentration to the highest results reported for the ASARCO sife.

The broad distribution site-wide fill with high metal concentrations was the reason for the November 16, 1994 agreement between NJDEP and Bridgeview Management Company to employ an alternate investigation method to investigate and ultimately remediate the site as a single Area of Concern. The AOC by AOC discussion presented above provides the most detailed information about historical site activities and their affect on the environment. Preparing it has been informative, and has helped to clarify a number of isauea relating to earlier investigations of the site and the locations of some of the earlier plant process areas.

Most importantly, the AOC by AOC discussion confirms and emphasizes that the only effective way to complete the investigation and select the site remedy is to employ an alternate investigation approach in accordance with NJAC 7:26E-1.6(d).

## 5.0 PROPOSED ALTERNATIVE INVESTIGATION WORKPLAN

The proposed investigation was prepared recognizing that the site is completely covered with a blanket-of contaminated soil and fill. Because the fill is derived from either historic on-site processes or the buildings which housed those processes, the same suite of contaminants is found throughout the site. This suite includes metals, base/neutral compounds (mostly polycyclic aromatic hydrocarbons (PAHs) derived from coal and coal combustion residues), and PHC. Of these, only metals are present in groundwater at concentrations exceeding the applicable NJDEP Groundwater Quality Standards (GWQS).

The PAHs are relatively insoluble, as evidenced by their absence from ground water. The solubility of the metals is variable but generally fairiy low. Although dissolved metals are oresent in the groundwater, there are no downgradient water supply wells. The only groundwater receptors are Crane's Creek and Arthur Kill. Groundwater dilution modeling has shown that "groundwater contaminants from the site do not have an adverse effect on the surface water quality of Arthur Kill" Therefore, the contaminant migration pathway-of corricern with regard to PAHs and metals is direct exposure or ghysical contact with the contaminated material. Accordingly, site-wide capping was agreed to be a suitable remedial alternative for the site in 1996.

<sup>&</sup>lt;sup>48</sup>. See: Remedial Investigation Report: Site Hydrological Study, June 2002. The model determination will be verified by sampling surface water sampling proposed in this document.

<sup>&</sup>lt;sup>49</sup>. See Letter from Alexander Spiezio of NJDEP to Barry C. Harris of Bridgeview Management Co., December 3, 1996.